

Woods Hole Oceanographic Institution

# Laboratory for Ocean Sensors and Observing Systems (LOSOS)

# Owner Project Requirements Design Phase

March 17, 2011

## **Owner's Project Requirements - Design Phase**

### Woods Hole Oceanographic Insitution (WHOI) Laboratory for Ocean Sensors and Observing Systems (LOSOS) 360 Woods Hole Road Woods Hole, MA 02543

#### **Owner and User Requirements**

LEED

Describe the primary purpose, program, and use of the proposed project and pertinent project history. Provide any overachieving goals relative to program needs, future expansion, and flexibility, quality of materials and construction and operational costs.

General Project Information:

Project Name: LOSOS Laboratory - WHOI

Owner: Woods Hole Oceanographic Insitution

Type: Research and Engineering Laboratory

Square Footage: 26,600 sq.ft.

Stories: 2

Primary Purpose: Ocean Research and Engineering Laboratory

Pertinent Project History: New Construction

Construction Budget: \$9,400,000

Construction Schedule: Construction Start: 3/21/11 - Construction End: 6/30/12

Operational Costs Budget: The operating costs for LOSOS will be included in the overall Plant Operations and Maintenance budget for all buildings and laboratories of Woods Hole Oceanographic Institution. The estimated operational cost per square foot specific to LOSOS is \$35.21. Therefore, the estimated annual operating cost is \$936,638.

Future expansion goals for the facility: The laboratory design and engineering considerations include the addition of a future 3<sup>rd</sup> floor for offices and conference space.

Flexibility changes in occupancy type, number of occupants or user activity: The laboratory design includes flexible space in the electronics prep/instrument prep area to accommodate for the changing operational needs of the particular sensor group that is being maintained.

#### WHOI LOSOS Owner Project Requirements - Design Phase

#### **Owner and User Requirements (continued)**

Quality of materials:

Building Life: 50 years (estimated)

Warranty Requirements: minimal 1 year

General Building Standards: The laboratory will be constructed in strict accordance of the 8<sup>th</sup> edition of the Massachusetts Building Code.

#### **Environmental and Sustainability Goals**

LEED 2.2

Describe any specific environmental or sustainability goals.

The Woods Hole Oceanographic Insitution LOSOS project will be designed to achieve the LEED<sup>™</sup> Certified Silver level of sustainability under the US Green Building Council's Leadership in Energy and Environmental Design<sup>™</sup> (LEED<sup>™</sup>) green building rating system - LEED for New Construction v. 3.0.

#### **Environmental Goals Narrative:**

The project will include an integrated approach to sustainable design in the development of the design of this project. The team will consider a wide range of sustainable building strategies for the project. In the initial LEED assessment, the Project Team will evaluate and articulate the project's goals and the certification level sought currently, planned to be LEED Silver. The following primary elements of sustainable design have been preliminarily identified based on LEED criteria as those that could be incorporated into the building.

#### A. Sustainable Sites

The site will meet sustainability goals through:

- 1. Selecting a site that is appropriate and reducing the building's impact on the site
- 2. Providing access to alternative transportation with access to public transportation and facilitating the use of bicycles
- 3. Storm water Design
- 4. Reducing light pollution from the building.

#### B. Water Efficiency

Increase water efficiency by:

- 1. Using water efficient landscaping
- 2. Reducing water use overall.

#### **Environmental Goals Narrative: (continued)**

- C. Energy and Atmosphere
  - 1. Optimize energy performance The building systems and envelope shall be designed to achieve a minimum performance 14% more efficient than required by ASHRAE 90.1-2007, promoting energy efficiency and performance with:
    - a. Variable volume air handling systems with variable speed fans
    - b. High efficiency filtration systems
    - c. Premium efficiency type motors
    - d. High-frequency electronic ballasts and T-5 lamps
    - e. Light-emitting diode (LED) exit lights
    - f. NEMA TP 1-2002 compliant dry-type transformers
  - 2. Enhanced commissioning will be performed by a third party to verify systems perform in accordance with the Owner's operating requirements
  - 3. Enhanced refrigerant management zero use of CFC based refrigerants. Selected refrigerants will have zero or low ozone depleting potential and minimal direct global warming potential
- D. Materials and Resources
  - 1. Construction waste management will be used to divert 75% of waste materials from landfills, incinerators, etc.
  - 2. Materials with recycled content will be used wherever possible
  - 3. Regional materials will be used wherever possible
- E. Indoor Environmental Quality

The project will enhance indoor air quality through:

- 1. Outdoor air delivery monitoring
- 2. CO2 detection in densely occupied spaces
- 3. Construction IAQ management plan both during construction and before occupancy
- 4. Use of low emitting materials
- 5. Indoor pollutant source control
- 6. Controllability of lighting systems, including daylighting lighting control systems to minimize use of building lighting systems
- 7. Thermal comfort design HVAC systems and exterior wall to comply with ANSI/ASHRAE Standard 55-2004, *Thermal Environmental Conditions for Human Occupancy*,
- Daylight and Views design to allow occupants access to outdoor daylight and views

#### Sustainability Goals Narrative:

The Woods Hole Oceanographic Insitution has established a Sustainability Task Force to provide assistance in establishing sustainability and resource conservation objectives and to provide liaison with employees, students, guests, visitors and vendors to increase awareness of the importance of resource and energy conservation and sustainability issues. This role includes the following:

- Implementing a campaign for sustainability. Educate and inform employees regarding the benefits of conservation and specific ways each individual and department can contribute.
- Promoting involvement by the WHOI community with an exchange of ideas and information, encouraging active participation in sustainability and resource conservation.
- Improving employees' understanding of utility costs. Encourage employees to take an active role in saving energy to reduce utility costs. Identify potential projects based on life cycle cost analysis to identify potential savings as well as the impact of such projects on departments, individuals, and the WHOI community.
- Providing educational material on energy savings including energy saving tips. Inviting outside resources and investigating existing information models to further educate employees on sustainability issues and resource conservation.
- Establishing an internal webpage to provide utility information and to encourage feedback from WHOI community. Include a checklist of energy saving ideas on the site.
- Establishing an Energy Challenge, a healthy competition between departments and/or buildings, to see who can generate the most useful recommendations for sustainability. Establish an acknowledgement program for individuals or groups who achieve the greatest results.

### **Energy Efficiency Goals**

#### LEED 2.2

Describe overall project energy efficiency goals relative to local energy code or ASHRAE Standard or LEED. Describe any goals or requirements for building sitting, landscaping, façade, fenestration, envelop and roof features that will impact energy use.

The Woods Hole Oceanographic Insitution LOSOS project will perform 25 % better than current ASHRAE 90.1 in Lighting Power. The commissioning process will track utility bills through the first year of operation to verify that the goal is met

Describe any goals or requirements for the following features which will impact energy use. What quality control measures or commissioning requirements are necessary to verify the goals and requirements are achieved.

#### **Energy Efficiency Goals (continued)**

#### Site:

Site development will include paved staging areas adjacent to the building to allow for efficient delivery of raw materials, loading and unloading of the instruments, and storage of large buoys and other instrumentation while under servicing. These delivery and staging areas are strategically located to provide access to spaces in the building that house key operations - the Receiving Area and the High Bay - and to instrumentation laboratories flanking these spaces. Staff parking for the facility will also be accommodated in the paved area, in a manner conducive with the staging and delivery activities. The building will make use of existing utilities found along the Ring Road which include the electrical grid, water, and gas. Sanitary service will be provided by the existing on-site campus treatment facility located nearby. The site development will also include a bridge connection between the LOSOS and Clark Lab where collaborating scientists' labs and offices are housed, and where access to the WHOI shuttle bus is available.

#### Landscaping:

The LOSOS building will be significantly screened from public ways by the natural topography of Quissett Campus, by forested buffer, and by largely native plant materials that are proposed to be installed in keeping with the current landscape. Existing woodland and understory will be protected from construction activity as much as possible. The limit of disturbance is delineated on the landscaping plan, and construction in accordance with that plan will be carefully monitored. For existing trees located adjacent to proposed grading, site salvaged boulders will be carefully placed to retain and prevent soil from covering the root flare. The necessary clearing is viewed as a design opportunity, providing the condition for successional growth and indeterminacy. Providing new meadow, edge, and woodland habitat will lead to increased biodiversity and a more successful connection between human development and the natural environment. Restoration, increased habitat, and successional growth will be supplemented by proposed plantings. The design team has worked closely with the Cape Cod Commission staff to finalize a plant palette best suited for the local microclimate. Larger trees will shade parking and pedestrian seating areas, while smaller trees are proposed within restoration zones and for areas with steeper slopes. Smaller trees allow for ubiquitous planting, while improving the rate of successful plant establishment. Tree and shrub plantings will blend with the woodland edge, stabilize and prevent slope erosion, cleanse storm water, and provide fruit for wildlife. The plantings will also soften and complement architectural features, while providing attractive views from multiple vantage points, including roadways, pedestrian paths, parking and utility areas, and interior lab spaces.

#### Façade:

The architectural design of the LOSOS facility is intended to reflect its status as a significant addition to WHOI's world class research facilities while remaining consistent with existing adjacent buildings and recent newer additions to the Quissett campus. The exterior walls will be clad predominantly in horizontal wood siding that will weather over time to a light grey. The penthouse and stair towers are to be clad in zinc panels, which will also weather to a light grey color. Aluminum framed windows and associated sun shades will be finished in a light color.

#### WHOI LOSOS Owner Project Requirements - Design Phase

#### Facade: (continued)

The massing of the proposed building is simple and straightforward; two stair towers at either side of the building's high bay space will be expressed on the exterior of the building, while the high bay doors are to be sheltered by a canopy that extends continuously between the two stairs. The mechanical penthouse will be centered on the building, held back from the building's edges to minimize its visibility from the ground. External roof mounted mechanical equipment is to be screened behind aluminum louvers. also finished in a light color. A graceful pedestrian bridge will provide access from the adjacent Clark Laboratory and visitor parking to the northeast of the new building. **Fenestration:** 

The fenestration will comply with project requirements intended to achieve the rating LEED Silver, as measured and documented according to the USGBC LEED Green Building Rating System- LEED for New Construction v. 3.0.

#### **Envelop:**

The project requires all contractors to implement practices and procedures to meet the project's environmental performance goals, which include achieving LEED certification. All materials comprising the building envelop will comply with project requirements intended to achieve the rating LEED Silver, as measured and documented according to the USGBC LEED Green Building Rating System- LEED for New Construction v. 3.0.

#### **Roof Features:**

The roofing for LOSOS is designed to be a mechanically fastened PVC roofing system, including membrane, insulation, protection board, and all other materials required for a complete installation. The specification for the energy performance of the roofing system includes one listed on the DOE's ENERGY STAR "Roof Products Oualified Product List" for low-slope roof products.

#### WHOI LOSOS Owner Project Requirements – Design Phase

#### Indoor Environmental Quality Requirements

#### LEED 2.2

As applicable and appropriate, for each program/usage area describe the intended use; anticipated occupancy schedules; space environmental requirements (including lighting, space temperature, humidity, acoustical, air quality, ventilation and filtration criteria); desired user ability to adjust system controls; desire for specific types of lighting; and accommodations for after hour use.

#### Please see Attachment 1

#### WHOI LOSOS Owner Project Requirements – Design Phase

#### **Equipment and Systems Expectations**

#### LEED 2.2

As applicable and appropriate describe the desired level of quality, reliability, type, automation, flexibility and maintenance requirements for each of the systems to be commissioned. When known, provide efficiency targets, desired technologies or preferred manufactures for building systems

#### **Commissioned Systems**:

Please see Attachment 2

### **Building Occupant and O&M Personnel Requirements**

#### LEED 2.2

Describe how the facility will be operated, and by whom. Describe the desired level of training and orientation required for the building occupant to understand and use the building systems.

#### **Operations and Maintenance:**

Name: David Derosier

Company: Woods Hole Oceanographic Insitution Job Description: Director of Facilities Responsibilities: Planning, organizing, staffing, direction, and control of activities relating to the WHOI's physical plant including buildings and laboratories Skill Level: 16 years of experience operating HVAC, DDC and or Lighting Control systems. Previous training / Licenses: Masters of Science in Facilities Management, B.S. in

Previous training / Licenses: Masters of Science in Facilities Management, B.S. in Facilities Engineering, Licensed Construction Supervisor, Massachusetts, Waste Water Treatment Operator Grade 5C, Massachusetts.

Name: Richard Galat

Company: Woods Hole Oceanographic Insitution

Job Description: Facilities Engineer

Responsibilities: Designs, estimates costs, and assists with the operation and maintenance a wide variety of mechanical and electrical systems throughout WHOI buildings and laboratories.

Skill Level: 30 years of experience in operating HVAC, DDC and or Lighting Control systems.

Previous training / Licenses: Bachelor of Science in Civil Engineering, Waste Water Treatment Operator Grade 5C, Massachusetts.

Name: Kevin Thompson

Company: Woods Hole Oceanographic Insitution

Job Description: Plant Supervisor

Responsibilities: Operates, repairs and maintains the installation of all mechanical and related facility process systems and major equipment of WHOI buildings and laboratories.

Skill Level: 21 years of experience in operating HVAC, DDC and or Lighting Control systems.

Previous training / Licenses: Licensed Journeyman's Pipefitters, Massachusetts; EPA Type I & II Refrigeration Certification; Oil Heat Technician Certificate of Competency, Massachusetts; Waste Water Treatment Operator Grade 5C, Massachusetts.

#### **Operations and Maintenance: (continued)**

Name: Matthew Foye Company: Woods Hole Oceanographic Insitution Job Description: Assistant Plant Supervisor Responsibilities: Operates, repairs and maintains the installation of all mechanical and related facility process systems of WHOI buildings and laboratories. Skill Level: 18 years of experience in operating HVACR systems; 12 years of experience in operating DDC systems. Previous training / Licenses: Several training seminars from Siemens onsite and at factory. Licensed department public safety refrigeration technician #019987; Universal refrigerant recovery license.

#### **Training requirements:**

The desired level of training includes:

- An overview of the purpose and operation of the equipment and systems performed by the installing contractors for all Mechanical Electrical and Plumbing (MEP) systems
- Intermediate level technical information of the systems performed by the equipment suppliers and installing contractors for MEP systems of medium operational complexity.
- Detailed level of technical information performed by factory trained professionals for Mechanical systems of high operational complexity.

Occupant orientation requirements: The Woods Hole Oceanographic Institution Facilities Department personnel will provide orientation required to building occupants

| WHOI LOSOS OPP  | Space Schedule   |                          |           |                                       |             |          |             |             |               |             |                         | and the second s |              |            |                       |                     |
|-----------------|--|--------------------------|-----------|---------------------------------------|-------------|----------|-------------|-------------|---------------|-------------|-------------------------|--|--------------|------------|-----------------------|---------------------|
|                 |  |                          |           |                                       |             |          |             |             |               |             |                         |  |              | i          |                       |                     |
|                 |  |                          | -         | Occupancy Schedule                    | space       | Space    | Air Quality | Air Quality | Air Quality   | Accoustical |                         | User ability to a  | adjust syste | m controls | Accomodations for     | Additional          |
| Room #          | Space Name   | Use                      | Occupants | (ASHRAE Standand 90.1 2007)           | Temperature | Humidity | Ventilation | Filtration  | Operable Sash | Requirement | Desired Lighting Levels | Temperature  | Humidity     | Lighting   | after hours use       | Requirements        |
| OOI Group       |  |                          | 1         |                                       |             |          |             |             |               |             |                         |  |              |            |                       |                     |
| 101             | Buoy/Mooring Prep and Maintenance  | High Bay                 | 2         | Laboratory Schedule                   | 72          | 50       | Code        | MERV 14     | N/A           | Standard    | Ambient, Task, Daylight | Yes  | ! No         | Yes        | Laboratory Schedule   | None                |
| 102             | Wet Lab  | Laboratory               | 0         | Laboratory Schedule                   | 72          | 50       | Code        | MERV 14     | N/A           | Standard    | Ambient, Task, Daylight | Yes  | No           | Yes        | Laboratory Schedule   | None                |
| 201             | PI Sensor Integration and Qual Lab   | Laboratory               | . 0       | Laboratory Schedule                   | 72          | 50       | Code        | MERV 14     | Yes           | Standard    | Ambient, Task, Daylight | Yes  | No           | Yes.       | Laboratory Schedule   | None                |
| 202             | Instrument/Electronics Prep Lab  | Laboratory               | 6         | Laboratory Schedule                   | 72          | 50       | Code        | MERV 14     | Yes           | Standard    | Ambient, Task, Daylight | Yes  | No           | Yes        | Laboratory Schedule   | None                |
| 103             | Q/A and Receiving Area   | Instrument receiving     | 2         | Laboratory Schedule                   | 72          | 50       | Code        | MERV 14     | Yes           | Standard    | Ambient, Task, Daylight | Yes  | No           | Yes        | Laboratory Schedule   | None                |
| 104             | Secured Inventory  | Component inventory      | 0         | Laboratory Schedule                   | 72          | 50       | Code        | MERV 14     | No            | Standard    | Ambient, Task, Daylight | No   | No           | Yes        | Laboratory Schedule   | None                |
| 212-214         | O&M Offices  | Enclosed Offices         | 6         | Office Schedule                       | 72          | 50       | Code        | MERV 14     | Yes           | Standard    | Ambient, Task, Daylight | Shared   | No           | Yes        | Office Schedule       | None                |
| 203             | OMC Offices  | Enclosed Offices         | ; 4       | Office Schedule                       | 72          | 50       | Code        | MERV 14     | Yes           | Standard    | Ambient, Task, Daylight | Yes  | No           | Yes        | Office Schedule       | None                |
| 204             | OMC Offices  | Open Offices             | 12        | Office Schedule                       | 72          | 50       | Code        | MERV 14     | Yes           | Standard    | Ambient, Task, Daylight | Yes  | No           | Yes        | Office Schedule       | None                |
| 205             | Admin Office   | Open Office              | 1         | Office Schedule                       | 72          | 50       | Code        | MERV 14     | Yes           | Standard    | Ambient, Task, Daylight | Yes  | No           | Yes        | Office Schedule       | None                |
| 211             | Conference Room  | Conference               | 0         | Office Schedule                       | 72          | 50       | Code        | MERV 14     | Yes           | Standard    | Ambient, Task, Daylight | Yes  | No           | Yes        | Office Schedule       | None                |
| 206             | Operations Room  | <b>Operations Review</b> | 0         | Laboratory Schedule                   | 72          | 50       | Code        | MERV 14     | N/A           | Standard    | Ambient, Task, Daylight | Yes  | No           | Yes        | Laboratory Schedule   | None                |
| 207             | File Storage   | Storage                  | 0         | Office Schedule                       | 72          | 50       | Code        | MERV 14     | N/A           | Standard    | Ambient, Task, Daylight | Shared   | No           | Yes        | Office Schedule       | None                |
| OPCID Casura    |  |                          |           |                                       | ·           |          |             |             |               |             |                         |  | -            |            |                       |                     |
| OBSIP Group     | and the last of the second sec | 1.T.                     | 0         | Televerse Cohestate                   |             |          | · Carda     | A AC DU A A |               | Canada and  | Autor Test Dediale      | Need   |              | Maria      | 1.1.1.1.1.1.1.1       | a seconda da        |
| 118             | Mechanical Lab   | Laboratory               | 0         | Laboratory Schedule                   | . 72        | 50       | Code        | MERV 14     | N/A           | Standard    | Ambient, Task, Daylight | res  | NO           | res        | Laboratory Schedule   | None                |
| 113             | Electronics Assembly/Disassembly   | Assembly areas           | 0         | Laboratory Schedule                   | 1 72        | 50       | Code        | MERV 14     | N/A           | Standard    | Ambient, Task, Daylight | Tes  | NO           | Tes        | Laboratory Schedule   | None                |
| 110             | Clean Electronics  | Assembly areas           | 0         | Laboratory Schedule                   | 12          | 50       | Code        | MERV 14     | N/A           | Standard    | Ambient, Task, Daylight | . Yes  | No           | Yes        | Laboratory Schedule   | Room Pressure Conti |
| 111             | Testing Room   | Laboratory               | 0         | Laboratory Schedule                   | 12          | 50       | Code        | MERV 14     | N/A           | Standard    | Ambient, Task, Daylight | Yes  | No           | Yes        | Laboratory Schedule   | Room Pressure Conti |
| 120             | High Latitude Environmental Cold Room  | Environmental Chamber    | 0         | (Stand Alone System)                  | N/A         | N/A      | N/A         | N/A         | N/A           | N/A         | N/A                     | N/A  | N/A          | N/A        | (Stand Alone System)  | None                |
| 112-11/         | OBSOffices   | Enclosed Offices         |           | Uffice Schedule                       | 12          | 50       | Lode        | MERV 14     | Yes           | Standard    | Ambient, Task, Daylight | Shared   | No           | Yes        | Office Schedule       | None                |
|                 |  |                          |           |                                       |             | +        |             | ·           |               |             |                         |  | -            |            |                       |                     |
| MVCO Group      | INCO I - 1   | Takana -                 |           | Laboration Coloradate                 | 77.5        | 50       | Card        | 44501434    | il/a          | deres de la | Ambles Test Dedista     | No.  |              | ×          | 1.1                   | 1                   |
| 105             | MVCO Lab   | Laboratory               | 0         | Laboratory Schedule                   | 72          | 50       | Lode        | MERV 14     | N/A           | Standard    | Ambient, Task, Daylight | Yes  | No           | Yes        | Laboratory Schedule   | None                |
| 215             | MyCOOnce   | Enclosed Office          |           | Office Schedule                       | . 12        | 50       | Lode        | MERV 14     | 162           | Standard    | Ampient, Task, Dayiight | Tes  | NO           | Yes        | Unice schedule        | None                |
| ESP Group       | · · · · · · · · · · · · · · · · · · ·  |                          |           |                                       | 1           |          |             |             |               | 1           | the transformer         |  |              |            |                       |                     |
| 119             | ESPlab   | Laboratory               | 0         | Laboratory Schedule                   | 72          | 50       | Code        | MERV 14     | Yes           | i Standard  | Ambient, Task, Daylight | Yes  | No           | Yes        | Laboratory Schedule   | None                |
| 106.107         | ESP Offices  | Enclosed Offices         | 1 2       | Office Schedule                       | 72          | 50       | Code        | MERV 14     | N/A           | Standard    | Ambient, Task, Davlight | Shared   | No           | Yes        | Office Schedule       | None                |
|                 |  |                          | -         | · · · · · · · · · · · · · · · · · · · |             |          |             | 100110-000  |               |             |                         |  |              |            | 1                     |                     |
| Shared Space    | · · · · · · · · · · · · · · · · · · ·  |                          |           |                                       |             | -        |             |             |               |             |                         |  | 1            |            | and the second second |                     |
| 205A            | Copy/Printer/Mail Room   | Common Space             | 0         | Office Schedule                       | 72          | 50       | Code        | MERV 14     | N/A           | Standard    | Ambient, Task, Daylight | Yes  | No           | Yes        | Office Schedule       | None                |
| 210             | Kitchen  | Common Space             | 0         | Office Schedule                       | 72          | ; 50     | Code        | MERV 14     | N/A           | Standard    | Ambient, Task, Daylight | Yes  | No           | Yes        | Office Schedule       | None                |
| 200             | Lobby  | Common Space             | 0         | Office Schedule                       | 72          | 50       | Code        | MERV 14     | N/A           | Standard    | Ambient, Task, Daylight | Yes  | No           | Yes        | Office Schedule       | None                |
| 100A,B,C        | Corridor- First Floor  | Egress Pathway           | 0         | Office Schedule                       | 72          | 50       | Code        | MERV 14     | N/A           | Standard    | Ambient, Task, Daylight | Yes  | No           | Yes        | Office Schedule       | None                |
| 200A, B, C      | Corridor- Second Floor   | Egress Pathway           | 1 0       | Office Schedule                       | 72          | 50       | Code        | MERV 14     | N/A           | Standard    | Ambient, Task, Daylight | Yes  | No           | Yes        | Office Schedule       | None                |
| \$101,201,301   | Stair- north   | Egress Pathway           | 0         | (Stand Alone System)                  | 72          | 50       | Code        | MERV 14     | N/A           | Standard    | Ambient, Task, Daylight | Yes  | No           | Yes        | (Stand Alone System)  | None                |
| \$102,202,302   | Stair-east   | Egress Pathway           | 0         | Stand Alone System)                   | 72          | 50       | Code        | MERV 14     | N/A           | Standard    | Ambient, Task, Daylight | Yes  | No           | Yes        | (Stand Alone System)  | None                |
| Support Space   |  |                          | 1         |                                       |             |          |             |             |               |             |                         |  |              |            |                       |                     |
| 121.122.216.217 | Womens' Room/Mens' Room  | Lavatories               | 0         | Office Schedule                       | N/A         | N/A      | Code        | MERV 14     | N/A           | Standard    | Ambient, Task, Davlight | Shared   | No           | Yes        | Office Schedule       | None                |
| 109,301         | Mechanical Room  | Support Space            | 0         | (Stand Alone System)                  | N/A         | N/A      | N/A         | N/A         | N/A           | Standard    | Task                    | N/A  | N/A          | Yes        | (Stand Alone System)  | None                |
| 108             | Electrical Switchgear  | Support Space            | 0         | (Stand Alone System)                  | N/A         | N/A      | N/A         | N/A         | N/A           | Standard    | Task                    | N/A  | N/A          | Yes        | (Stand Alone System)  | None                |
| 209             | Tel/Data   | Support Space            | 0         | (Stand Alone System)                  | N/A         | N/A      | N/A         | N/A         | N/A           | ! Standard  | Task                    | N/A  | N/A          | Yes        | (Stand Alone System)  | None                |
| 302             | Elevator Machine Room  | Support Space            | 0         | (Stand Alone System)                  | N/A         | N/A      | N/A         | N/A         | N/A           | Standard    | Task                    | N/A  | N/A          | Yes        | (Stand Alone System)  | None                |
| 201             | Elevator Johny   | Support Space            | 0         | Office Schedule                       | 77          | 1 50     | Code        | MEDV 14     | NIZA          | T Standard  | Ambient Task Daulight   | Channel  | Nia          | Vor        | Office Cabadata       | Nano                |

#### WHOI LOSOS OPR Cmmissioned Systems (Attachment 2)

| WHOI LOSOS OPR Commissioned Systems  |                              |                             |  |                  |                       |               |                |                                       |
|--------------------------------------|------------------------------|-----------------------------|--|------------------|-----------------------|---------------|----------------|---------------------------------------|
| Priorities (numerical: 1 = Highest)  | Rank                         |                             |  |                  |                       |               |                |                                       |
| First Cost                           | 5                            |                             |  |                  |                       |               |                |                                       |
| Quality                              |                              |                             |  |                  |                       |               |                |                                       |
| Operating Cost                       |                              |                             |  |                  |                       |               |                |                                       |
|                                      | 4                            |                             |  |                  |                       |               |                |                                       |
| Energy Enciency                      | 3                            |                             |  |                  |                       |               |                |                                       |
| Reliability                          | 1                            |                             |  |                  |                       |               |                |                                       |
| Simplicity                           | 6                            |                             |  |                  |                       |               |                | · · · · · · · · · · · · · · · · · · · |
| Ease of Equipment/System Maintenance | /                            |                             |  |                  |                       |               |                |                                       |
| Other                                |                              |                             |  |                  |                       |               |                |                                       |
| Highest Priority                     | Air Handing and Distribution | the hat have have been bank | Poles Endargs fem  | ne faument       | Ushing Control Streen | one the Water | Punbing Steens | Building Enverope                     |
| Redudancy                            | <u>N/A</u>                   | N/A                         | <u>N/A</u>   | <u>N/A</u>       | N/A                   | N/A           | N/A            | N/A                                   |
| Flexibility                          | Medium                       | Medium                      | Medium   | Medium           | Medium                | Low           | Low            | Low                                   |
| Automation                           | Medium                       | Medium                      | Medium   | Medium           | Medium                | Medium        | Medium         | Medium                                |
| Enerergy efficiency                  | High                         | High                        | High   | High             | High                  | High          | High           | High                                  |
| Operator Desference                  |                              |                             |  |                  |                       |               |                | l                                     |
| Manufacturer                         | Cassier                      | Classing Density            | Constants  | WILLON Chandrand | Calman                | A O Carith    | 51/0           | A1/A                                  |
|                                      | Carrier                      | Cleaver Brooks              | Greenneck  | WHOI Standard    | Seimens               | A U Smith     | N/A            | N/A                                   |
|                                      | Irane                        | Veissmann                   | COOK   |                  |                       |               |                |                                       |
|                                      | IVICQUay                     | Buderus                     | New York Blower  |                  |                       |               |                |                                       |
| System Type                          | WHUI Standard                | WHOI Standard               | WHOI Standard  | WHOI Standard    | WHOI Standard         | WHOI Standard | WHOI Standard  | WHOI Standard                         |
| Fuel Source                          | - Electric                   | Natural Gas                 | Electric   | WHOI Standard    | Electric              | Natural Gas   | N/A            | N/A                                   |
| Special Requirements                 | None                         | None                        | Corrosion Resistant  | None             | None                  | None          | None           | None                                  |
| System<br>Highest Priority           | Standy Energency Coverador   | Muheel Urs                  | 4000 March 1 and 1 |                  |                       |               |                |                                       |
| Redudancy                            | N/A                          | N/A                         | N/A  |                  |                       |               |                |                                       |
| Flexibility                          | Medium                       | High                        | High   |                  |                       |               |                |                                       |
| Automation                           | High                         | High                        | High   |                  |                       | -             |                |                                       |
| Energy efficiency                    | High                         | High                        | High   |                  |                       |               |                |                                       |
|                                      |                              |                             | -  |                  |                       |               |                |                                       |
| Operator Preference                  |                              |                             |  |                  |                       |               |                |                                       |
| Manufacturer                         | Caterpillar                  | Caterpillar                 | Russelectric   |                  |                       |               |                |                                       |
|                                      | Cummins                      | Vycon                       | ASCO   |                  |                       |               |                |                                       |
|                                      |                              |                             |  |                  |                       |               |                |                                       |
| System Type                          | WHOI Standard                | WHOI Standard               | WHOI Standard  |                  |                       |               |                |                                       |
| Fuel Source                          | Natural Gas                  | Electric                    | Electric   |                  |                       |               |                |                                       |
| Special Requirements                 | (See Note 1)                 | (See Note 2)                | Bypass Isolation   |                  |                       |               | <u> </u>       |                                       |
| Note 1                               | Standby nower to a           |                             | arch nlug loade via U  | PS building boot |                       |               |                |                                       |
|                                      | tel/data server room         | n A/C, environme            | ntal room and lab ext  | haust            | 15/                   |               |                |                                       |
| Note 2                               | Standby power to s           | erve selected rese          | earch plug loads via Fl  | wheel UPS syste  | m.                    |               |                |                                       |